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(54) Title: WASTE PLASTIC CONVERSION

(57) Abstract

The first aspect of the invention comprises: a method of recovering indiscriminate waste plastics comprising the following steps: preparation of medium from waste thinners and chemically active waste plastics, blending the inert plastic powders into this medium, blending other fibrous wastes into medium, blending abundant powder waste of flyash into mix, using reclaimed carbons and glass as reinforcement in the blend of medium and powdered plastics. The second aspect of the invention comprises: the method to utilize abundant waste thinners to prepare the medium (resin) without expensive filtration.

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TITLE

WASTE PLASTIC CONVERSION

Technical Field

THIS INVENTION is a method to recycle indiscriminate waste plastics without the need of separation and a process of preparation of such wastes. Combining with other wastes that adds strength to the mixture of plastics and a system to perform such process and an apparatus named INJECTRUSION to handle this indiscriminate plastic mixture and manufacture value added products.

BACKGROUND ART

Recycling of waste plastics are widespread throughout the world. Plastics are reclaimed within the plastic industry they add regrounds to virgin plastics at a rate of 5 percentage. Companies developed sandwich techniques where up to 25% of the same plastic reclaim is utilized in production of bottles. Some other methods use solvents to dissolve plastic waste and extruding it into pellets. The major impediments are the numerous plastic types that do not intermix like a jigsaw. The incompatibility of plastics means that the wastes have to be separated or at least selected for each blend. This adds to the cost of recycling and reusing. To deal with this problem intelligent identification systems have been developed. This is based on recognizing plastics with infra-red spectroscopy method. The problem is still the need of separation. If there are two component wastes, for instance PET bottle and HDPE bottle - top; or plastic and paper labels the articles have to be discarded most often mannually taken out of the system.

Although this separating system is working at acceptable level this is not the situation with industrial plastic wastes ; automobile plastic components or in general bulkier wastes and all other composite products. Coding systems introduced recently make those products easier to identify, but when they are joined with other materials (metal,paper,leather) they are currently dumped. Dumping of large quantities of plastics are widespread throughout the world complicating the problem by exporting the waste to third world countries.

Recovering the waste plastics is around 30 - 38 percentage, the bulk of these plastics are household packaging materials.

Indiscriminate plastic recycling is virtually non existant. There are no recycling schemes anywhere for 60 % of plastic wastes.

Categories of plastics are vast and new families of plastics are created at an increasing rate.

More common plastics are: acetal, ABS, Acrylic, CP, HDPE LDPE, EPS, PA, PA6, PAG, PC, PE, Pi, PS, PUR, PVC, UC, UPVC, SAN, etc

Products made from plastics that generate the wastes are: furniture, flooring, containers, toiletries, shavers, television sets, phones, radios, casettes, computers, hairdryers, cables, pipes power points, tools, vacuum cleaners, torches, food dishes, trays, glasses, shoes, goggles, clothes, swim flippers, packaging container scrapp cars,boats, toys, aviation parts, machine parts, space junk..

In general terms consumption of plastics worldwide is about 100 kg per head of population and is increasing at an annual rate of at least 5 percent.

DISCLOSURE OF THE INVENTION

It has been found that waste plastics can be prepared for recycling and even blending with each other together with other wastes can be used in the manufacturing of value added products.

Abundant waste thinners from paint companies, spray painters and chemically active plastics together with inert plastics can be blended and heated to form a new bond. The heating process partially de-polymerizes the plastics assisting new bond forming to take place under pressure.

In one form the invention comprises a method to use suitable thinners to be mixed with chemically active plastics like polystyrene, ABS, PVC. These thinners or solvents can be acetone, toluene, xylene, diethyl phthalate, dibutyl phthalate, tributyl Phosphate, butyl stearate and others.

The active plastics can form thick resins with the thinners that is a concrete like medium.

Inert plastics are granulated in the usual fashion and they are further micronized to fine particles. Micronization is an important advantage. A better intermixing can be achieved and melting temperature is spread quicker through the medium.

The blend is loaded to its utmost potential. The plastic powders are thoroughly mixed into the resin. In some instances other wastes can be incorporated in the mix. They can only be fillers but can act as reinforcing agents adding strenght to the final product.

Such fillers/reinforcers can be fine - fibre paper, shredded natural fibres, flyash, carbon black (from tyres)glass.

This specific blending method assures a homogeneous mix . The resin considerably increases the absorption of heat, assisting of the fast elimination of excess solvents.

As the melt temperature is selected at the highest melting point of a given plastic, partial depolimerisation takes place and thus the monomers of the various plastics interpolymerize and form a new bond. The lower melt temperature plastics act like a cement glue that reinforce the molecules. During the heating the reinforcing fillers are coated with the plastics and assist in the interbonding.

In the absent of waste thinners virgin solvents and or other hydrocarbons can be used.

A typical blend can incorporate the following: waste thinners(including pigment contaminant)polystyrene waste, polypropelene, polyvinylcloride,flyash,fine-fibre paper. Another mix is made up of : waste thinners, polystyrene, ABS,HDPE, PP, glass reinforced ABS, carbon black and fine-fibre paper. Yet another preparation will contain: waste or virgin thinners/solvents, ABS,PET, nitrile,flyash, copper dust.

The combinations of the mixes could be varied according to the requirement of the product design.

The most important aspect of this recycling is that the plastics can be mixed in any quantity.
This type of recycling system can be fully automated to handle all waste plastics, combine them with other fibrous waste and produce value added products.

The invention includes in a further form an apparatus for using the prepared plastic blend to manufacture plastic pipes of various thicknesses.

The apparatus is a combination of injection and extrusion machine. As the number of plastics have a variable heat softening point they also have a variable cooling/hardening time scale.

The pressurized melt-chamber will soften the plastic compound injecting it into a pipe cavity. As the cavity fills the inner support pipe is pulled within an outher support pipe. At this section the plastic pipe is being cooled. The walls of the newly made plastic pipe is supported until the product is totally cooled off.

This apparatus is utilizing two combined methods of plastic production and it is named INJECTRUSION.

By changing the outher and inner support pipes' diameter all sizes of plastic pipes can be manufactured.

Utilizing this techniques all types of products can be moulded from indiscriminate waste plastic blends.

Articles that are manufactured from blends with injection techniques preferably have to have longer cooling cycles.

DESCRIPTION OF THE DRAWINGS

FIGURE 1 is the FLOW CHART of the preferred preparation system of the waste thinners and plastics.

FIGURE 2 shows the grinding and blending of plastics with conventional methods. The micronization is not illustrated on figure 2.

FIGURE 3 is a schematic diagram of a new method of INJECTRUSION according to the embodiment of the invention.

FIGURE 4 is a temperature/time correlation of a trial run of the injectrusion.

FIGURE 5 are magnified photo images of the injectruded plastic pipe.

BEST MODE OF PERFORMING THE INVENTION

Referring to figure 1 there is disclosed various components used in a preferred method to prepare the plastics and thinners.

Specifically figure 1 discloses a chemical storage area(thinners) A . Above this area there is a fume extractor marked G attached to a condenser F which condenses and channels the liquid to liquid tanks D.

The thinners are pumped through a filter. Pump being B and filter is marked C. The filtration does not remove fine particles of pigments only lumpy, foreign materials and solidified paint. Plastic "0" stockpile marked H is a stockpile of chemically active plastics , that is that these plastics dissolve in thinners. The compactor I transfers the plastics from stockpile H into liquid tanks D concentrating them . Pump B2 transfers the resin to a storage E.

The plastic "1 - infinite stockpile J contains all plastics available in the waste stream regardless of type, size, colour. This plastic pile is granulated by granulator K and then washed of liquid and other impurities by a mobile wash conveyor L.

The granulated waste plastics are drained and dryed at system M. The water is filtered for reuse and solids collected at station N.

The plastics now advance to a pulverizer O where they are ground to fine powder which are stored in holding tank P. From this stock a mobile vacuum loader Q picks up the powder plastic and a weigh/mix station R will blend/tir the compound once more. The next stage of the process is a blending tank S where the ground plastics (and other fillers X) are mixed blended with resin from storage E to its optimum loading potential. The blend is introduced to the compression chamber T where together with the heater unit U the plastic blend is compressed and heated to the designed melting point of 180 - 240° C. The heat can be supplied by oil - electrical element - infra red - microwave heatsource. The rotational moulder V is a fully automated injectrusion, injection or extrusion system. The innovative properties of the injectrusion version will be explained in more details on figure 3.

The products : pipes and/or any plastic articles are stockpiled at storage station W.

Figure 2 is a diagram of indiscriminate plastic waste. A conveyor/feed hopper feeds this product to grinder and a secondary blender. After washing this grind the plastics are micronized/pulverized to fine powder of 20-45 micron size. This is a very important advantage for preparing a thouroughly mixed compound and assist in heating to penetrate at a faster and even way.

Figure 3 shows the injectrusion method developed for indiscriminate waste plastic recycling and in this diagram deals in particular with the manufacturing of pipes.

The lenght of the machine is equal to the outer support pipe 1 within this support sleeved support pipe 2. The outher support pipe 1 is stationary the inner pipe which covered with a sleeve in order to assist in demoulding is the sleeved support pipe 2 is attached to a retractable wall 5 which is mobilized with the retractor screw marked 6.

The fixed wall 14 the retractable wall 5 the outer support pipe 1 and the sleeved support pipe 2 form the pipe cavity 3 into where the molten plastic 13 is extruded under pressure by the pressurized melt chamber 4. This is fed with the plastic blend 12 by a vacuum evacuator 18 from the product container 11.

The pressurized melt chamber has an outlet 16 where excess solvent is bled off. In the event that the thinners are dried prior pressure melting the outlet is closed. The drawn off thinners are colected as solvent at 17. The sleeved support pipe 2- 6 meter long and for this reason and for stability it is supported with fixed supports 15.

As the pipe cavity3 is getting filled with plastic the retractable wall 5 pulls the sleeved support pipe 2 into the outer support pipe 1 where the newly formed plastic pipe will be cooled. The cooling system 8 is situated in the support bench 00 under the outer support pipe 1. which is encased in a cooling jacket 7. Water is supplied by water pipes 19. The water is cooled and circulated in cooling tower 10

The diameter of the outer support pipe 1 and the inner sleeved support pipe 2 can be varied accordind to the requirement of the plastic pipe to be produced. Alternately several fixed sized machines could opperate side by side.

Figure 4 deals with the injectrusion of a plastic pipe. This was a trial where the actual intention was to accurately log the temperatures and the power.

Figure 5 shows the partial depolymerization and the subsequent interpolymerization of the monomers together with the glue like reinforcement of the fibres. On these pictures some cavities are visible they have developed due absence of bleeding outlets.

CLAIMS :

1. A method of recovering indiscriminate waste plastics comprising the following steps

preparation of medium from waste thinners and chemically active waste plastics

blending the inert plastic powders into this medium

blending other fibrous wastes into medium

blending aboundant powder waste of flyash into mix

using reclaimed carbons and glass as reinforcement in the blend of medium and powdered plastics

2. The method to utilize aboundant waste thinners to prepare the medium(resin)without expensive filtration

3. The method as claimed in claim 2 that all solvents are suitable for the production of the medium

4. The method as claimed that the inert plastic wastes are prepared as a fine powder that is another central point of interblending capability heating capability

partial depolymerization and the subsequent replymerization

5. A method as claimed wherein the chemically active waste plastics act like a cement glue to form a strong jigsaw like bond with the multiple combination of plastics.

6. A method as claimed to utilize the combination of injection and extrusion technique. This claim includes the claim to the terminology of INJECTRUSION.

7. The method as claimed where a plastic pipe can be manufactured from indiscriminate and large number of plastic wastes in a continous operation.

8. This method claims to be able to produce all the different diameter pipes as the market demands The method as claimed that the outer support pipe 1 and the sleeved support inner pipe 2 make it possible continous injection/extrusion of molten plastics to produce pipe.

9. The method as claimed to have a flexible system whereby the blend can be dried of thinners prior to injectrusion or during the process.

10. The method as claimed wherein the plastics heated with the highest allowable temperature that advances the partial depolymerization rearangement and coedhesion of innumerable plastic types into the required object.

11. The method as claimed that metalic powder can be incorporated into selected plastic blends

12. The method as claimed wherein a ready made article utilizing waste plastics can be recycled again and again

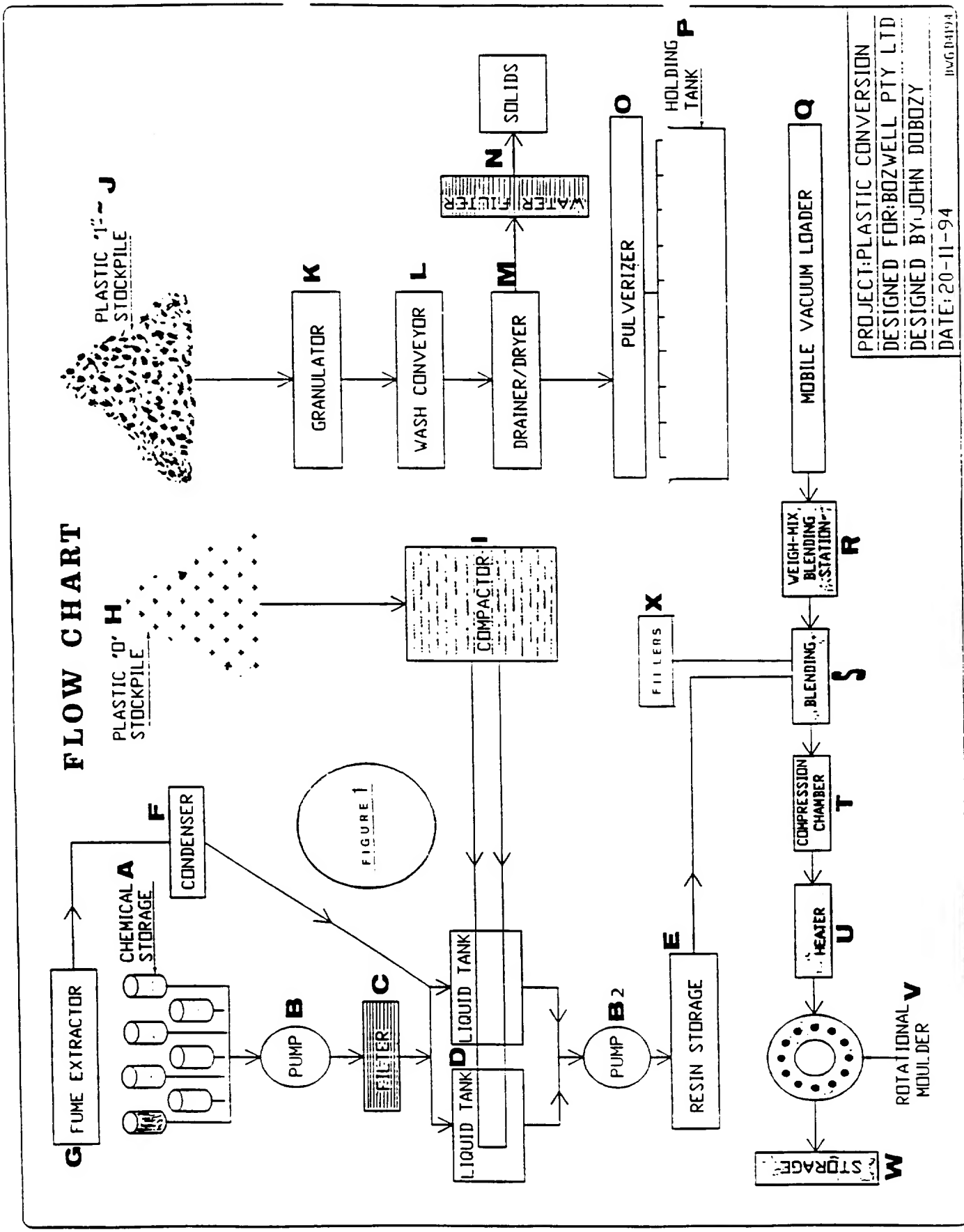
13. The method as claimed that all types of products can be manufactured from indiscriminate waste plastic blend wherein they are prepared as claimed in claims 1 / 4 and 11.

14. The method as claimed that melting the blend can be achieved with oil/element/microwave/infra red heating and with generation of energy from the utilization of excess waste plastics.

15. A method as claimed wherein the compound can be totally carbonized for the production of new monomers.

Dated 10th October 1995

Inventor John Geza Dobozy


FLOW CHART
PLASTIC '1' STOCKPILE J
PLASTIC 'D' STOCKPILE H
GRANULATOR K
WASH CONVEYOR L
DRAINER/DRYER M
WATER FILTER N
SOLIDS
PULVERIZER O
HOLDING TANK P
MOBILE VACUUM LOADER Q
VEIGH-MIX, BLENDING STATION R
COMPACTOR I
FILLERS X
BLENDING S
COMPRESSION CHAMBER T
HEATER U
ROTATIONAL MOULDER V
STORAGE W
RESIN STORAGE E
PUMP B2
LIQUID TANK D
LIQUID TANK
FILTER C
PUMP B
CHEMICAL STORAGE A
CONDENSER F
FUME EXTRACTOR G
FIGURE 1
PROJECT:PLASTIC CONVERSION
DESIGNED FOR:BOZWELL PTY LTD
DESIGNED BY:JOHN DOBOZY
DATE: 20-11-94

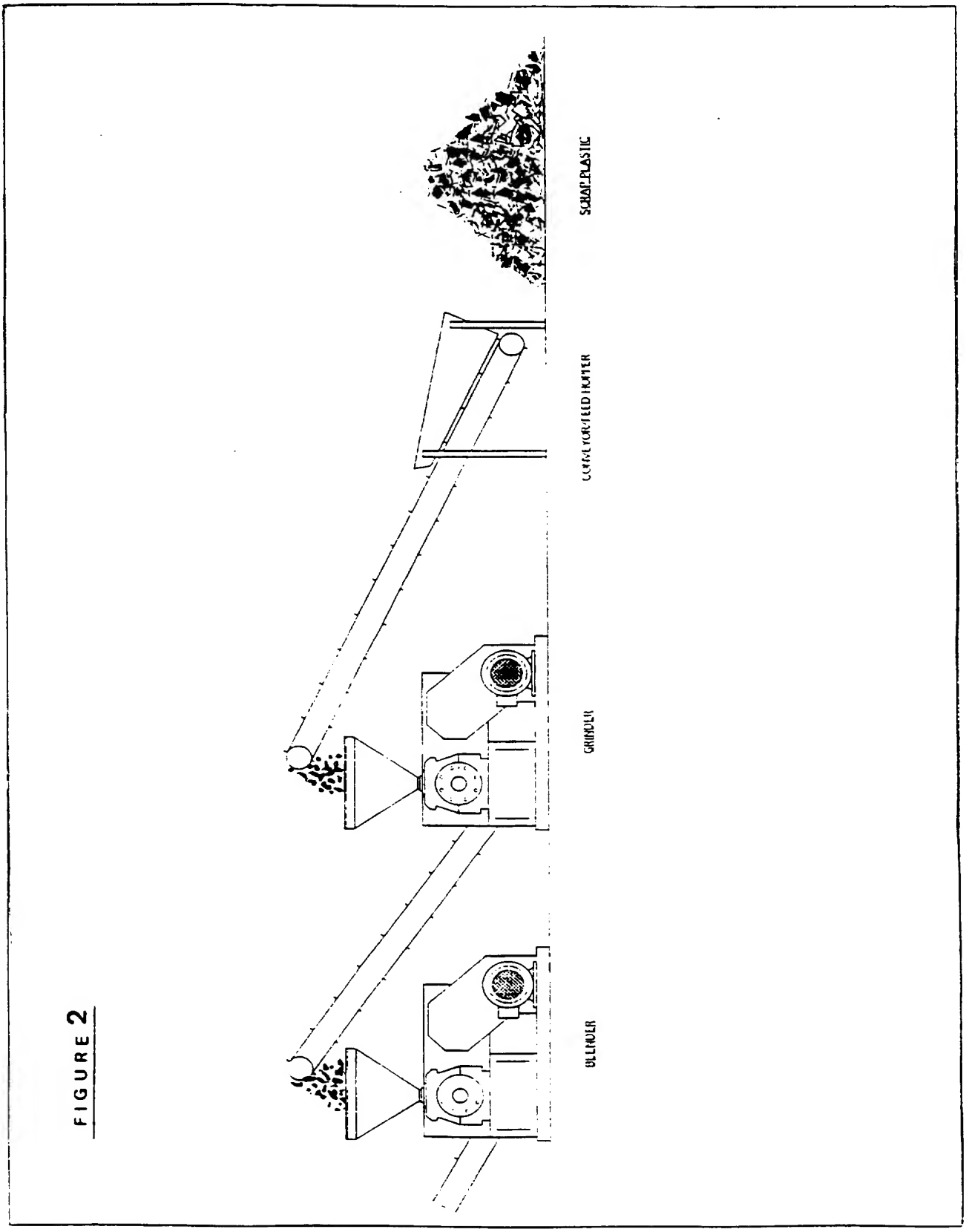


FIGURE 2

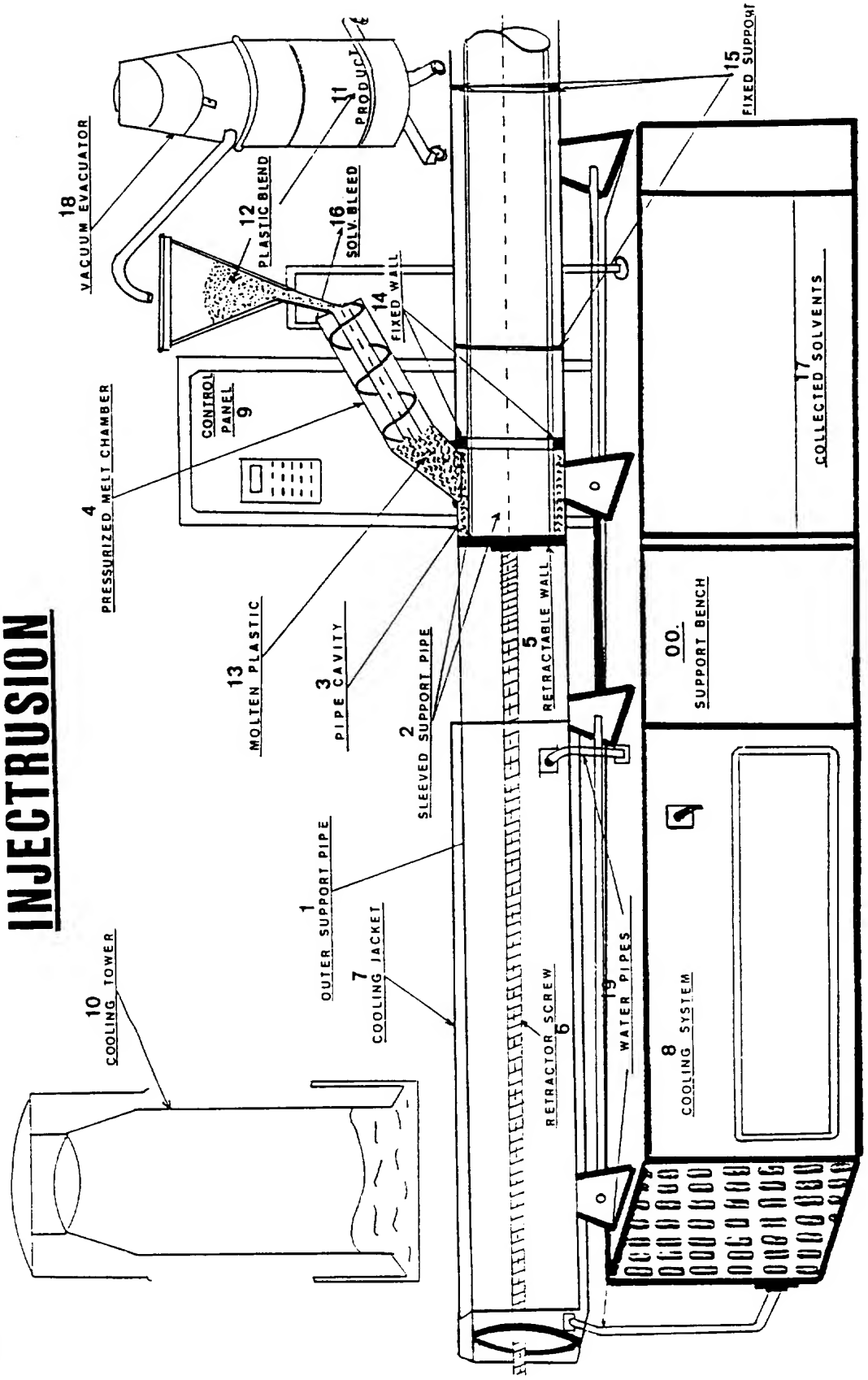
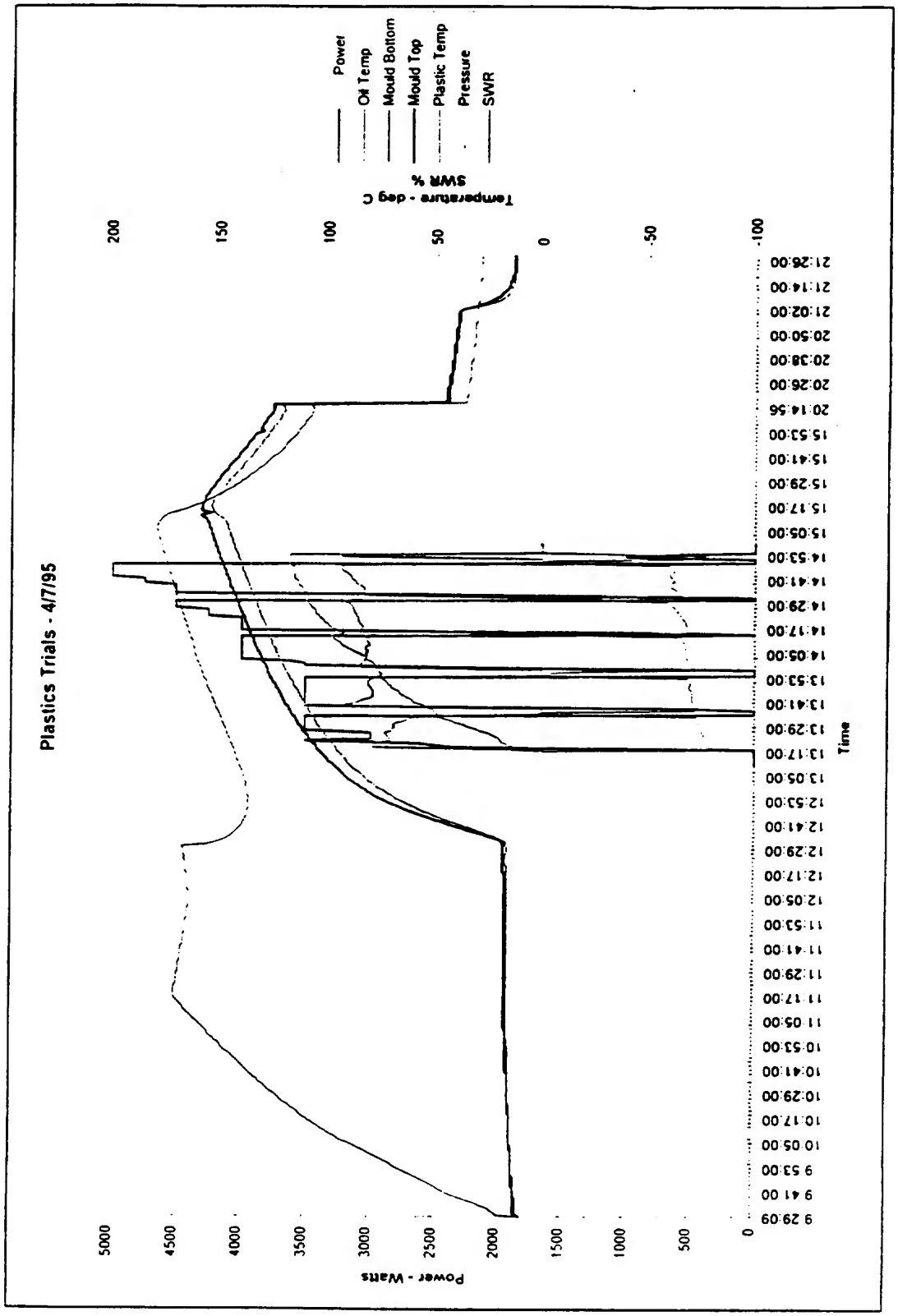

INJECTRUSION
18 VACUUM EVACUATOR
11 PRODUCT
12 PLASTIC BLEND
16 SOLV. BLEED
14 FIXED WALL
15 FIXED SUPPORT
CONTROL PANEL 9
4 PRESSURIZED MELT CHAMBER
17 COLLECTED SOLVENTS
13 MOLTEN PLASTIC
3 PIPE CAVITY
2 SLEEVED SUPPORT PIPE
5 RETRACTABLE WALL
00 SUPPORT BENCH
1 OUTER SUPPORT PIPE
7 COOLING JACKET
10 COOLING TOWER
6 RETRACTOR SCREW
19 WATER PIPES
8 COOLING SYSTEM
JOHN GEZA DOBOZY 8OCT.1995

FIGURE 3


Plastics Trials - 4/7/95
Power
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Mould Bottom
Mould Top
Plastic Temp
Pressure
SWR
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SWR %
Power - Watts
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100
50
0
-50
-100
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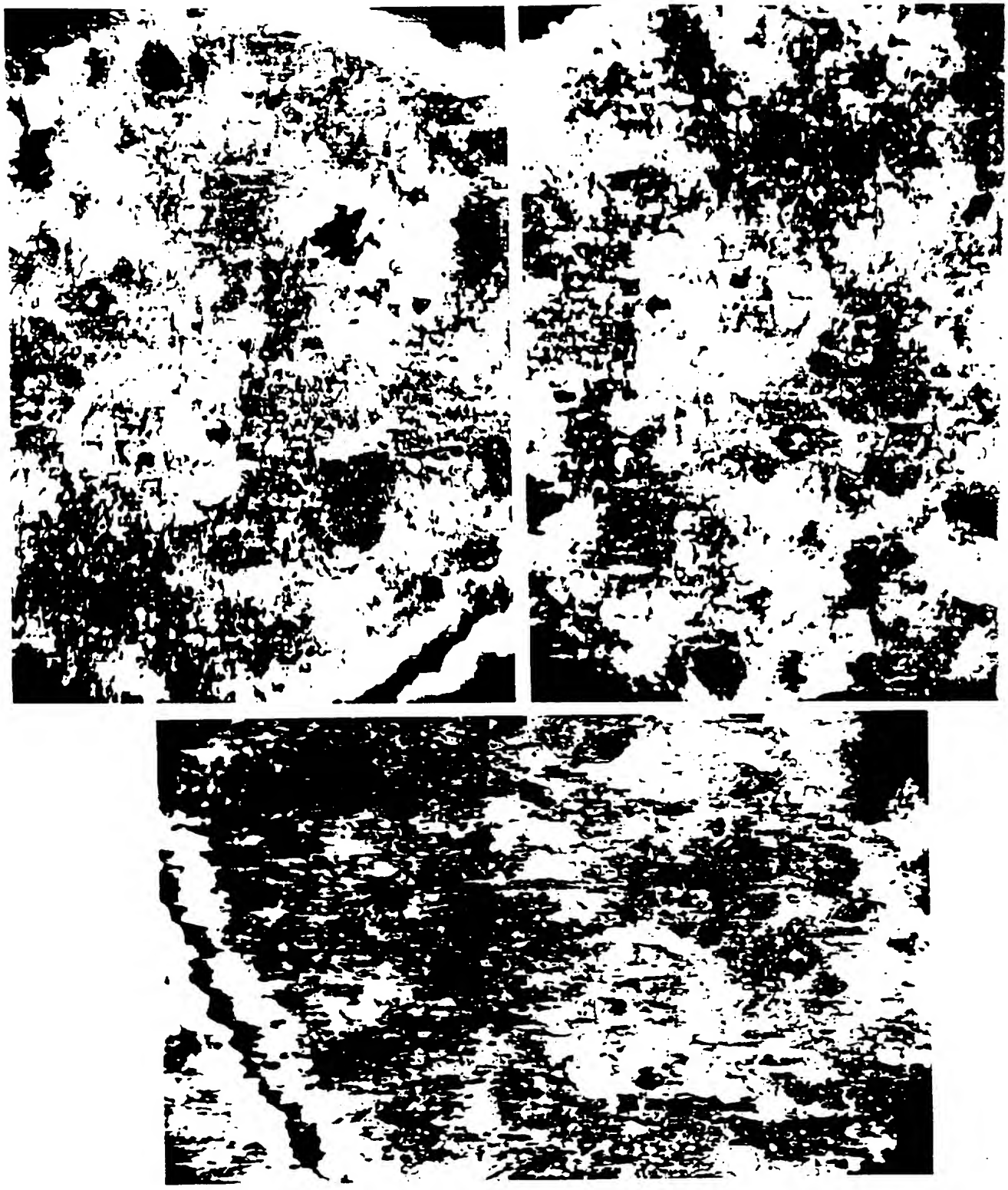
FIGURE 4

FIGURE 5



INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 95/00676

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[6]: C08J 11/18 11/20 11/22 F16L 9/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC C08J 11/04 11/08 11/18 11/20 11/22 11/24 11/26 11/28

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU : IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Derwent WPAT Online Abstract Accession No. 92-416249, CA,A, 2039201 (ROOMAN M G) 28 September 1992 abstract	1-2
P. X	DE, 4323320 A1 (HENDRICK X H) 12 January 1995 whole document	2
P. X	DE, 4333994, A1 (ZOLLER J) 20 April 1995 whole document	2

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Date of the actual completion of the international search	Date of mailing of the international search report
25 February 1996	15.03.96
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No.: (06) 285 3929	Authorized officer L. MENZ Telephone No.: (06) 283 2431

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 95/00676

C (Continuation) **DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Derwent Abstract Accession No. 94-197242/24, Class A13, JP, 06-136178,A (NAGAURA Y) 17 May 1994 abstract	2

INTERNATIONAL SEARCH REPORT

International Application No.
PCT/AU 95/00676

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Patent Document Cited in Search Report	Patent Family Member
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